(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

132

(19) World Intellectual Property Organization
International Bureau

Application No.: 10/723,778
Filing Date: 11/26/2003
Docket Number: IMM174 (51851-279589)

(43) International Publication Date
18 April 2002 (18.04.2002)

PCT

(10) International Publication ...
WO 02/31807 A1

(51) International Patent Classification[7]: G09G 5/08

(21) International Application Number: PCT/US01/31077

(22) International Filing Date: 4 October 2001 (04.10.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/685,684 10 October 2000 (10.10.2000) US

(71) Applicant: **MOTOROLA INC., A CORPORATION OF THE STATE OF DELAWARE** [US/US]; 1303 East Algonquin Road, Schaumburg, IL 60196 (US).

(72) Inventors: **HWANG, Sung-gui**; 860 Hinman Avenue, #323, Evanston, IL 60202 (US). **KOEHL, Thomas W.**,; 1903 W. Ainslie, #3, Chicago, IL 60640 (US).

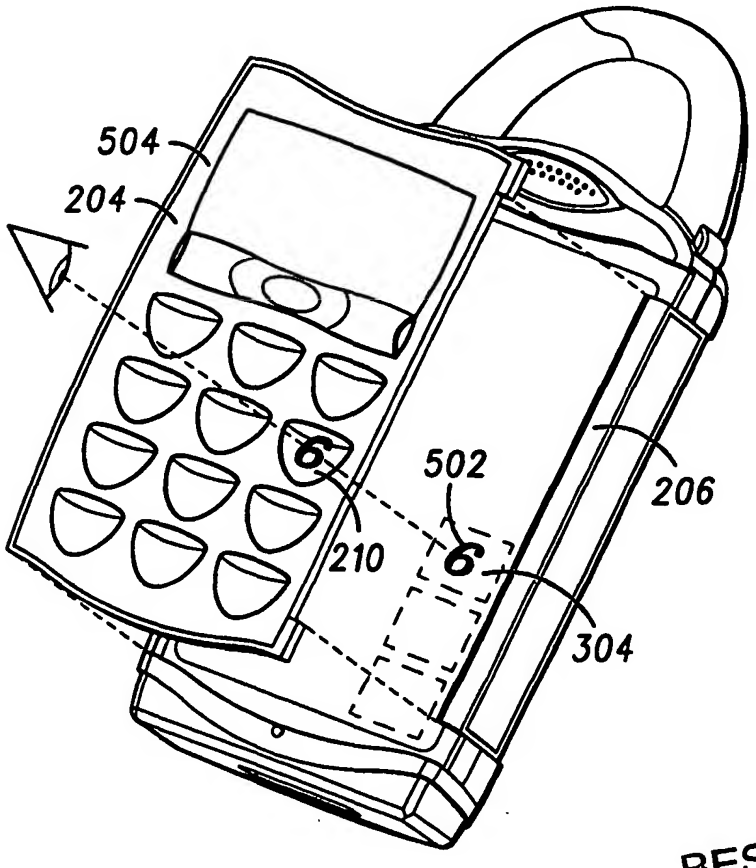
(74) Agents: **VAAS, Randall S.**, et al.; MOTOROLA, INC., 600 North U.S. Highway 45, Libertyville, IL 60048 (US).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: DATA ENTRY DEVICE



(57) Abstract: A data entry device (Fig. 7) having a touch screen display (214) with software definable images, or soft keys, and a movable keypad (208) that covers the touch screen display in a closed position (200). The keypad has at least one transparent key (210) which further comprises an actuator (408) on a second side (404) and a substantially smooth surface, or lens on a second side (402). When the keypad is in the closed position the software definable images are projected through the transparent keys to the user. The user may then depress the transparent key associated with a corresponding image, causing the actuator to contact the touch screen display and thereby select the desired function. Each transparent key provides tactile feedback to the user indicating the transparent key has been sufficiently depressed. The device therefore retains tactile feedback of traditional keypads, while allowing each key to be dynamically labeled to in accordance with the mode of operation.

WO 02/31807 A1

Published:
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Data Entry Device

BACKGROUND OF THE INVENTION

The invention relates generally to a configurable data entry device and more particularly an apparatus providing tactile feedback to the configurable data entry device while maintaining configurability of the data entry device.

Portable electronic devices are becoming more and more popular as size, weight and functionality improve. Some of these portable devices function as wireless communication devices and traditionally include such devices as cellular telephones, two-way radio services, or cordless phone services just to name a few. Other portable devices do not incorporate wireless connectivity but are carried extensively by the user. For example, Personal Digital Assistants (PDAs) can be used for many functions including personal information management or games. These devices are currently available to the consumer, largely as separate products. However, devices have begun to emerge enclosing two or more devices within one housing. For example, the combination of a cellular radiotelephone and a personal digital assistant (PDA), or a radio transceiver and a PDA, allowing wireless communication. Convergence of these devices into one unit or multifunctional device, is the result of the desire to have internet access at all times as well as the increase in popularity of personal information devices, such as PDAs and the like. These types of devices are limited in number and have just begun to surface in the market place.

Short messaging devices having short messaging service (SMS) or similar capability are also popular allowing users to communicate with text messages as an alternative to voice communication. Devices with this capability are commonly used in meetings as they allow meeting participants to communicate with others not in the meeting on a real time basis. The user can type and send a message with the device without disrupting the meeting, whereas this is not the case with voice communication. More and more devices are becoming multifunction in nature and there for have user interfaces to accommodate the

multiple modes. However, most of these devices use software definable touch screen displays or similar devices, which do not provide the user with tactile feedback. As a result of the transition to portable multifunctional devices, the need to improve the user interface has become apparent.

Current single function devices such as a cellular radiotelephones generally have one or two functions assigned to each individual button on the user interface. For example very simple low cost radiotelephones include an alphanumeric keypad having only a numeral and the typical three or four letters assigned to an individual key. If the user is dialing a number, the keys associated with the desired numbers are depressed. If the user is entering a name, when storing a phone number for example, the user must cycle through the key having the desired letter until the letter appears on the output device or display because each key represents more than one letter. In more advanced cellular radiotelephones, the device may have other functions or options the user must access. This requires either more keys, further requiring more space and a larger device which is less conducive to portability, or adding more functions to the existing keys, increasing the complexity. In some cases the device size is not important and additional keys may not be an issue. However, in the growing portable wireless device market, small size and light weight is important as it allows the device to be easily transported. The device is more apt to be used, providing more billable usage to the service provider, if it is carried on the user at all times; small size and light weight promote this behavior. Adding another function to a key increases the complexity of operation as well as clutters the key with a plurality of indicia identifying the keys functions making the device more difficult to operate. As a result, this reduces the user inclination to use the device as all three deficiencies: complexity, size and weight discourage use and therefore billable time is reduced.

One method of providing more functions without increasing the complexity of device operation and yet maintain a portably favorable size and weight is to use a touch screen display. The touch screen is a combination input/output (I/O) device comprised of an input layer place on top of an output

layer. The output layer displays images which correspond with a designated input portion of the input layer. Software that controls the display defines or displays icons, which may for example resemble buttons or keys, on the display. Touching the icon of the output layer activates the designated input portion of the input layer, activating the desired function. This is commonly known as software defined keys or soft keys.

Use of a touch screen display, however, has several downfalls. First, it is not always viable for the user to look directly at the data entry portion of the device when entering or selecting functions. The tactile feedback of traditional keys, which allows the user to blindly select the keys while still entering the desired information, is not present.

Second it is desirable for the user in general to have tactile feedback when depressing a key. This acknowledges to the user that the key has been sufficiently depressed and the desired function has been activated. This is not available on current touch screen devices. Some devices may provide buttons over the touch screen device to provide a tactile feel however the buttons cover the touch screen, such as described in U.S. Patent 5,742, 894 assigned to Motorola Inc., the assignee of the present invention, and only act as an actuator, actuating the touch screen, therefore limiting the user to the functions indicated on the buttons.

Some devices incorporate an audible feedback tone alerting the user that the desired function has been activated and even further, other devices combine the audible feedback with the tactile feedback. Audible feedback alone however, may not be appropriate in all environments or user modes. For instance, audible keypad tones are not desired when the user is in a meeting yet desires to receive feedback when a key has been depressed. For example, a cellular radiotelephone having only audible feedback will not provide any feedback to the user if the audible feedback is turned off.

The use of additional keys also poses a problem as this requires more space within the device and cost reduction is almost always desired. Touch screen displays may add flexibility to the input output device however this

renders the device without tactile feedback to the user. The current methods are deficient in these areas by creating larger more complex devices that are less user friendly than predecessors. Touch screen displays without any feedback or audible feedback only limit the user's options and functionality to the user. Therefore, there is a need to improve the means and method of providing data input and output capability for portable electronic devices.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of the wireless communication device in accordance with the preferred embodiment of the present invention;

FIG. 2 is a front view of the wireless communication device with the second housing portion in the closed position in accordance with the preferred embodiment of the present invention;

FIG. 3 is a front view of the wireless communication device with the second housing portion in the open position in accordance with the preferred embodiment of the present invention;

FIG. 4 is a cross section view of one transparent key in a relaxed state in accordance with the preferred embodiment of the present invention;

FIG. 5 is a cross section view of one transparent key in a depressed state in accordance with the preferred embodiment of the present invention;

FIG. 6 is a cross section view of one transparent key in a relaxed state in accordance with an alternative embodiment of the present invention;

FIG. 7 is an exploded view of the wireless communication device in accordance with the preferred embodiment of the present invention;

FIG. 8 is a top view of the wireless communication device in accordance with the preferred embodiment of the present invention; and

FIG. 9 is FIG. 2 rotated 90° degrees showing the touch screen display in accordance with the preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention relates to a user interface and more particularly to the data entry portion of the user interface. The preferred embodiment of the present invention is a portable wireless communication device that combines a radiotelephone with personal information management capability. The user interface of the preferred embodiment of the present invention combines a touch screen display having a movable keypad incorporating transparent keys so that the touch screen display is visible through the transparent keys. The keypad is movable from a closed position, which allows the user to use the device as a phone and more voice-centric activity, using the keypad to enter telephone numbers, to an open position where the keypad moves away from the touch screen display, thereby fully uncovering the touch screen display for data-centric oriented operation. In the open position, using the keys of the keypad in conjunction with the soft keys of the touch screen display gives the user tactile feed back when entering data, yet allows the image of the soft key, which is displayed on the touch screen display, to be projected through the transparent keypad maintaining configurable soft key capability.

The block diagram in FIG. 1 shows a wireless communication device 100 in accordance with the preferred embodiment of the present invention. This device is a multifunctional wireless communication device incorporating the present invention. One function of the device is to operate as a radiotelephone in a cellular telephone system or the like. In the preferred embodiment a frame generator ASIC 102, such as a CMOS ASIC available from Motorola, Inc. and a microprocessor 104, such as a 68HC11 microprocessor also available from Motorola, Inc., combine to generate the necessary communication protocol for operating in a cellular radiotelephone system. Microprocessor 104 uses memory 106 comprising RAM 108, EEPROM 110, and ROM 112, preferably consolidated in one package 114, to execute the steps necessary to generate the protocol and to perform other functions for the wireless communication device, such as

accepting information from writing to a touch screen display 116, or controlling a frequency synthesizer 130, and receiving in a signal from a keypad sensor 136. ASIC 102 processes audio transformed by audio circuitry 124 from a microphone 122 and to a speaker 126.

A transceiver processes the radio frequency signals. In particular, a transmitter 128 transmits through an antenna 134 using carrier frequencies produced by a frequency synthesizer 130. Information received by the communication device's antenna 134 enters the receiver 132 that demodulates the symbols using the carrier frequencies from frequency synthesizer 130. The communication device may optionally include a message receiver and storage device 131 including digital signal processing means. The message receiver and storage device could be, for example, a digital answering machine or a paging receiver.

FIG. 2 shows the preferred embodiment of the present invention comprised of a first housing portion 202 coupled to a second housing portion 204 by a double hinge 206. The second housing portion 204 has a fixed transparent member or a lens 212 adjacent to a keypad 208. The keypad 208 is comprised of a plurality of transparent keys 210 either connected together as one piece or as individual keys. The keypad 208 is disposed in the second housing portion such that each transparent key 210 is accessible from both a front side 218 and a backside 302 of the second housing portion 204 as shown later. The plurality of transparent keys 210 of the preferred embodiment of the present invention, are arranged in a radiotelephone keypad array having keys operative to typical radiotelephone functions. These functions include dialing, entering personal information data, web browsing and other similar functions. When the second housing portion 204 is in the second housing portion first position or closed position 200, the transparent keys 210 of the keypad 208 partially cover the touch screen display 214 which is mounted in the first housing portion 202. The exposed portion of the touch screen display 216 visible through the lens 212 of the second housing portion displays information to the user and works in conjunction with the keypad 208 while the second housing portion is in the

closed position 200. While in the closed position, the sensor 136, either a magnetic reed switch as in the preferred embodiment, or by other detecting means is activated, signaling the microprocessor 104 that the second housing portion is in the closed position 200..

Turning to FIG. 3, the device is shown in the second housing portion second position or open position 300. In the open position 300, the touch screen display 214 is fully accessible to the user. The user can input data and view the touch screen display 214 directly and not through the transparent keys 210 or lens 212 of the second housing portion 202. This allows for the unlimited display and entry options as the touch screen display is configurable by software and can be programmed in accordance with the desired mode of operation. For example, the device may advantageously be used as a personal organizer having the capability to display a calendar, a to do list, personal contact information and other personal management data and the like. Even further, the device is intended to be used with internet browsing software that conform to such standards as the wireless application protocol (WAP) or iMode and the like to gain access to the internet in a wireless fashion. The device may also be used as a writing or drawing tablet wherein the touch screen display 214 is adapted for handwriting recognition or to receive drawing input respectively. The adaptability of a software definable touch screen display is only limited by microprocessor 104 capability and the amount of memory 106 necessary to store the given information, therefore allowing unlimited modes of operation.

FIG. 4 shows a cross section view of the first and second housing portions (202, 204), respectively, with the transparent key 210 in its relaxed, non-depressed state. The transparent keys 210 shown in combination with the touch screen display 214, advantageously give the user tactile feedback. Physically, the transparent keys 210 have a front side 402 and a back side 404. The front side 402 is accessible from the front side 218 of the second housing portion 204 and acts as a lens showing the image 310. This front side 402 may be a magnifying lens, magnifying the image 310 displayed on the touch screen display 214. The back side 404 of the transparent key 210 is accessible from the back side 302 of the

second housing portion 204. The back side 404 of the transparent key 210 has an actuator 408 protruding therefrom which makes contact with the touch screen display 214 when the transparent key 210 is depressed. Tactile feedback is provided in two ways. First the presence of a physical key as opposed to a soft key on a touch screen display 214, allows the user to advantageously locate and recognize the desired key through feel. The user does not need to look at the device to determine where the desired key is. In addition, when the transparent key 210 of the keypad 208 is depressed, tactile feedback is advantageously provided by the movement of the transparent key 210 as it is depressed toward the touch screen display 214.

FIG. 5 shows the same cross section as in FIG. 4 however the transparent key 210 is now in a depressed state. The transparent key 210 is integrally coupled to a webbed material 410 usually made of plastic, and elastomer, or PVC as in the preferred embodiment. The webbed material 410 generally forms the keypad 208, having a plurality of transparent keys 210 protruding therefrom. The webbed material 410 of the keypad 208 is located between the front side 402 and the back side 404 of the second housing portion 204. The front side 402 and the back side 404 of the transparent key 210, hold the keypad 208 in place by sandwiching the webbed material 410 therebetween. The transparent key 210 is accessible through the second housing portion 204 through an aperture in the front side 218 and the back side 302. The aperture in the backside 302 of the second housing portion 204 has a geometry larger than the transparent key 210 and the aperture in the front side 218, allowing the transparent button 210 to move downward towards the back side 318 when depressed. In the depressed state, the actuator 408 contacts a corresponding selectively active portion 304 of the touch screen display 214 closing the circuit and activating the desired function.

In an alternative embodiment of the present invention, shown in FIG. 6, the tactile feedback is provided by a poppel dome 612 of the poppel dome layer 610, mounted to the back side 404 of the second housing portion 204, placed in between the transparent keys 210 and the touch screen display 214. The actuator

408 contacts the poppel dome 612 when the transparent key 210 is depressed, and the poppel dome 612 in turn contacts the corresponding selectively active portion 304 of the touch screen display 214 thereby sending the desired input signal.

The tactile feedback is beneficial for three reasons. First, the tactile feel associated with the depression of the transparent key 210 beneficially compliments other feedback, such as an audible tone, the combination of which provide comprehensive feedback. Secondly, the tactile feedback advantageously allows the user to blindly enter data or dial the device as it allows the user to locate the transparent keys 210 without looking at the device. Lastly, the tactile feedback is further advantageous as hearing impaired users will not here the audible feedback tone and must rely on the tactile feedback provided by the transparent key 210. Yet in other device modes where a writing or drawing tablet is necessary, the keypad 208 can be moved out of the way of the touch screen allowing the user full access to the touch screen display to enter data accordingly. The key indicia or image of the preferred embodiment of the present invention, indicating the function of the transparent key 210, are provided by the touch screen display 214. Dynamic labeling, or software programability of the indicia, in conjunction with the tactile feel of the transparent key 210, maintains both the soft key configurability and tactile feedback of the data entry device.

The touch screen display 214, displays the appropriate indicia, visible through the transparent key 210 when the second housing portion 204 is in the closed position 200. Turning to FIG. 7, a first image 702 displayed by the touch screen display 214 is projected through the corresponding transparent key 210 to the user 506, shown by path 504, indicating to the user 506 which function will be carried out when the transparent key 210 is depressed. In the preferred embodiment of the present invention when the device is operating in a cellular radiotelephone mode, the touch screen display 214 would display an array of numbers corresponding in location to the array of transparent keys 210 of keypad 208 in a first touch screen display mode. In a second touch screen

display mode letters are displayed in the same manner as number, for the entry of words. In a third touch screen mode, a full text keyboard is displayed and the user may move the keypad 208 aside and enter the text directly via the full text keyboard. Each number or letter is displayed though its corresponding transparent key 210. This advantageously allows for a larger font to be used as the transparent key 210 is not displaying as much information at one time as an alphanumeric key would. This is beneficial as the transparent key 210 is easier to ready as a result of the larger font size. This is further beneficial as the transparent key is less cluttered with numerous indicia or images therefore reducing the complexity of the data entry device and the operation of the device in general.

The double hinge 206 has two joints, a first joint 306 coupling the second housing portion 204 to the hinge 206 and a second joint 308 coupling the hinge 206 to the first housing portion 202. This allows the second housing portion 204 to move freely about the first housing portion 202 as shown in FIG. 8, rotating from the closed position 200 wherein the keypad 208 mounted therein is planarly adjacent and effectively coupled thereto for interaction with the touch screen display 214 to an open position 300 wherein the keypad 208 is planarly adjacent to the back side of the first housing portion 202. In the second housing portion second position the second housing portion 204, and therefore the keypad 208, is out of the way of the user such that the touch screen display 214 can be used in any device orientation without the hindrance of the second housing portion 204. The free rotation capability of the second housing portion 204 allows the second housing portion to act as a stand, propping the device up into either a portrait configuration for speaker phone mode for one example or in a landscape orientation for viewing video or graphics of similar nature.

Depending on the operation mode of the device, the device will display the appropriate indicia on the touch screen display 214. The indicia that is displayed is projected through the transparent key 210 and the indicia is changed based on the mode of the device. In a first operation mode, a first icon is displayed, and the user can depress the transparent key 210, activating the touch

screen display 214 in the location corresponding to the first indicia which selects the first desired function. In a second operation mode the device software would display a second indicia representing a different function and the user would select the second desired function. For example, in cellular telephone operation mode, the software would display a numeric telephone keypad for dialing phone numbers. A second mode may be entering an individuals name when storing a phone number in the device's memory. In this case, as show in FIG. 9, the software would display a full text alphabetic keyboard 902 or a QWERTY keyboard for easy entry of the name by the user.

The previous description of the preferred embodiments are provided to enable any person skilled in the art to use the method of or making data entry devices. It is understood that this description is by way of example only and that numerous changes and modifications can be made by those skilled in the art without departing from the true spirit and scope of the invention. For example, although the present method and apparatus is for a cellular radiotelephone, it may also apply to other types of portable electronic devices such as personal digital assistants, digital cameras and the like. Further, other means of employing a tactile feedback may also be incorporated. The display, displaying the image that is projected through the transparent key does not have to be a touch screen display. Other displays such as a LED display or an organo-emissive display or the like may be incorporated into the invention.

We claim:

CLAIMS

1. A data entry device comprising:

a first housing portion having electronic circuitry disposed therein;

a user interface mounted in said first housing portion and having at least one input portion, said input portion sending a signal to said electronic circuitry in response to user input;

an image displayed on said user interface wherein a location of said image on said user interface corresponds to said at least one input portion of said user interface; and

a tactile keypad coupled to said first housing portion and having at least one transparent tactile key, said at least one transparent tactile key transmitting said image displayed on said user interface to a user when said at least one transparent tactile key is aligned therewith, wherein said at least one transparent tactile key has a lens portion and an actuator portion,

wherein said actuator portion is adjacent to said user interface and makes contact with said at least one input portion of said user interface when said transparent tactile key is depressed, and

wherein said transparent tactile key provides a tactile feedback to said user when said at least one transparent tactile key is depressed.

2. The data entry device of claim 1 wherein said tactile keypad is coupled to said first housing portion by a hinge.

3. The data entry device of claim 1 wherein said user interface is a touch screen display.

4. The data entry device of claim 1 wherein said user interface is a plurality of switches.

5. The data entry device of claim 1 wherein said at least one image of said user interface is software definable.

6. The data entry device of claim 1 wherein said at least one image has a geometry substantially the same geometry as said at least one transparent tactile key of said tactile keypad.

7. A wireless communication device comprising:

a first housing portion having a front outer surface, and a back outer surface;

a touch screen display mounted in said first housing and accessible from said front outer surface thereof, said touch screen display having an output portion and an input portion to display user information and receive user input, respectfully, wherein said output portion of said touch screen display is planarly adjacent to said input portion of said touch screen display, said input portion being transparent such that said display portion is clearly visible through said input portion, and wherein said input portion has at least one selectively active portion for receiving user input, and wherein said output display portion displays at least one image aligned with said selectively active portion;

a hinge coupled to said first housing portion, said hinge having a first axis;

a second housing portion having a first surface and a second surface, said second housing portion coupled to said first housing portion by said hinge wherein said second housing portion rotates about said first axis such that in a second housing portion first position, said second housing portion is planarly adjacent to said front outer surface and covers a portion of said touch screen display; and

a tactile keypad mounted in said second housing portion having at least one transparent key, said at least one transparent key having a front side and a back side,

wherein said at least one transparent key transmits said at least one image of said touch screen display to the user looking at said front side of said transparent key when said second housing portion is in said second housing portion first position,

wherein said at least one transparent key has an actuator portion protruding from said back side such that when said second housing portion is in said second housing portion first position said actuator is accessible from said second surface and is adjacent to said touch screen display such that when said at least one transparent key is depressed, said actuator activates said at least one selectively active portion of said touch screen display, activating a first desired function, and

wherein said at least one transparent key provides tactile feedback to the user when said at least one transparent key is depressed.

8. The wireless communication device of claim 7 wherein said at least one transparent key aligns with both said at least one selectively active portion of said input portion of said touch screen display and said at least one image of said output portion of said touch screen display in said second housing portion first position, such that said at least one image is visible to the user through said at least one transparent key.

9. The wireless communication device of claim 7 wherein said at least one image of said output portion is a software definable image.

10. The wireless communication device of claim 9 wherein said at least one software definable image has a geometry which is substantially the same geometry as a

corresponding said at least one transparent key such that said at least one software definable image is completely visible through said at least one transparent key when said second housing portion is in said second housing portion first position.

11. The wireless communication device of claim 7 wherein said hinge further comprises a second axis, wherein said second axis is substantially parallel to said first axis and wherein said first axis and said second axis are separated by a distance equal to half the distance separating said first surface of said first housing portion to said second surface of said housing portion and wherein said second housing portion rotates about said first axis and said first housing portion rotates about said second axis allowing said second housing portion to rotate from said second housing portion first position to a second housing portion second position wherein said second housing portion is planarly adjacent to said back outer surface of said first housing portion.

12. The wireless communication device of claim 7 wherein said touch screen display in a first operation mode displays a plurality of soft keys arranged in a radiotelephone configuration.

13. The wireless communication device of claim 12 wherein said tactile keypad having a plurality of transparent keys aligns with said plurality of soft keys arranged in a radiotelephone configuration.

14. The wireless communication device of claim 7 wherein said touch screen display in a second operation mode displays a plurality of soft keys arranged as a full text keyboard, and wherein said touch screen display in a third operation mode operates as a handwriting recognition device.

15. The wireless communication device of claim 7 wherein said touch screen display displays a plurality of software definable images including icons, buttons, or text.

16. The wireless communication device of claim 7 wherein said touch screen display in a fourth operation mode operates as a drawing tablet.

17. The wireless communication device of claim 7 wherein said touch screen display has an illumination means for backlighting said touch screen display.

18. The wireless communication device of claim 7 wherein said second housing portion in a second housing portion third position forms an angle between said first housing portion and said second housing portion between 90° degrees and 360° degrees.

19. The wireless communication device of claim 7 wherein said front side of said transparent key is a magnifying lens, magnifying said image of said touch screen display.

20. The wireless communication device of claim 7 wherein a transceiver is disposed in said first housing portion.

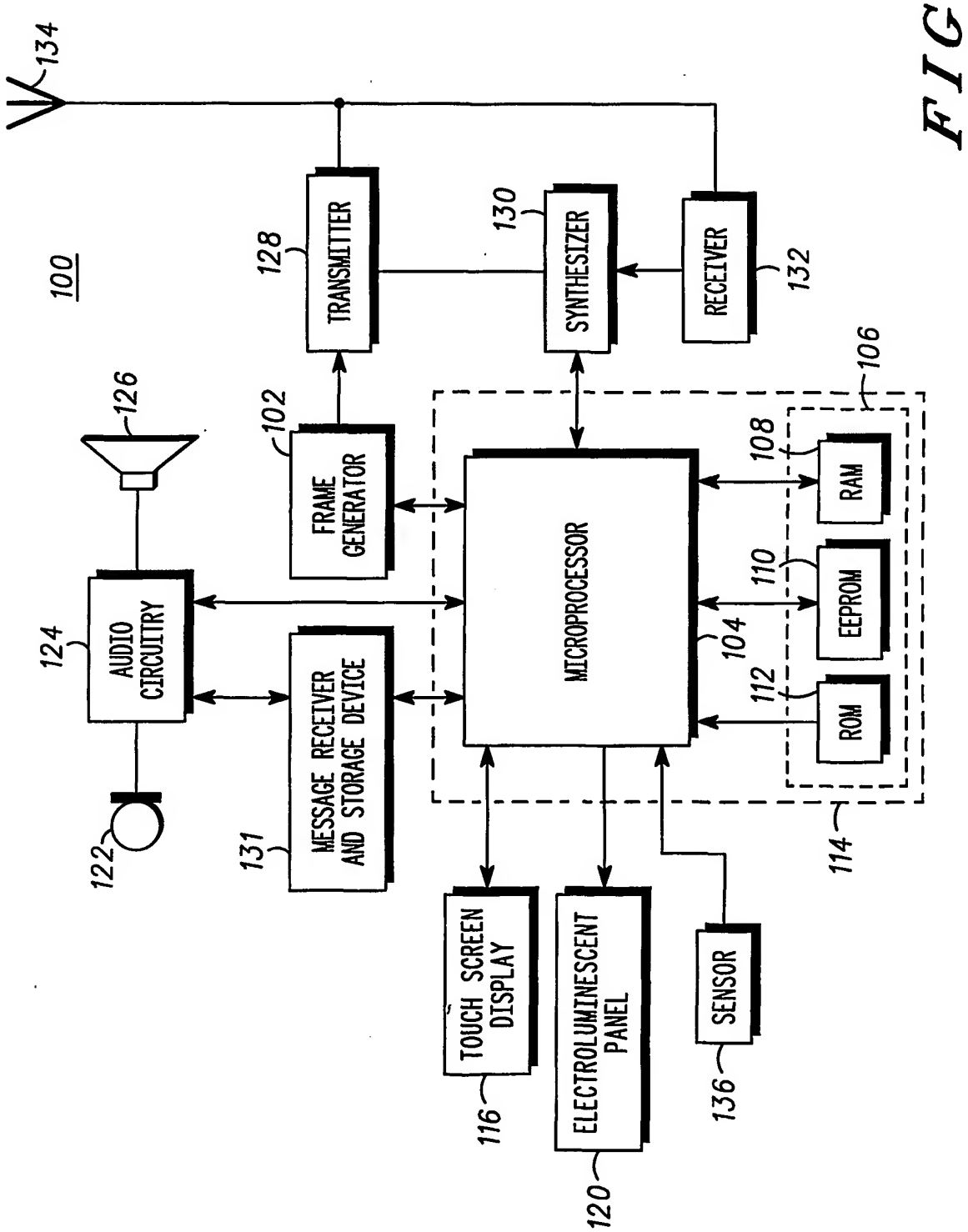

100
134
TRANSMITTER
128
SYNTHESIZER
130
RECEIVER
132
106
126
102
FRAME GENERATOR
MICROPROCESSOR
108
RAM
110
EEPROM
104
112
ROM
124
AUDIO CIRCUITRY
MESSAGE RECEIVER AND STORAGE DEVICE
131
122
114
TOUCH SCREEN DISPLAY
116
ELECTROLUMINESCENT PANEL
120
SENSOR
136

FIG. 1

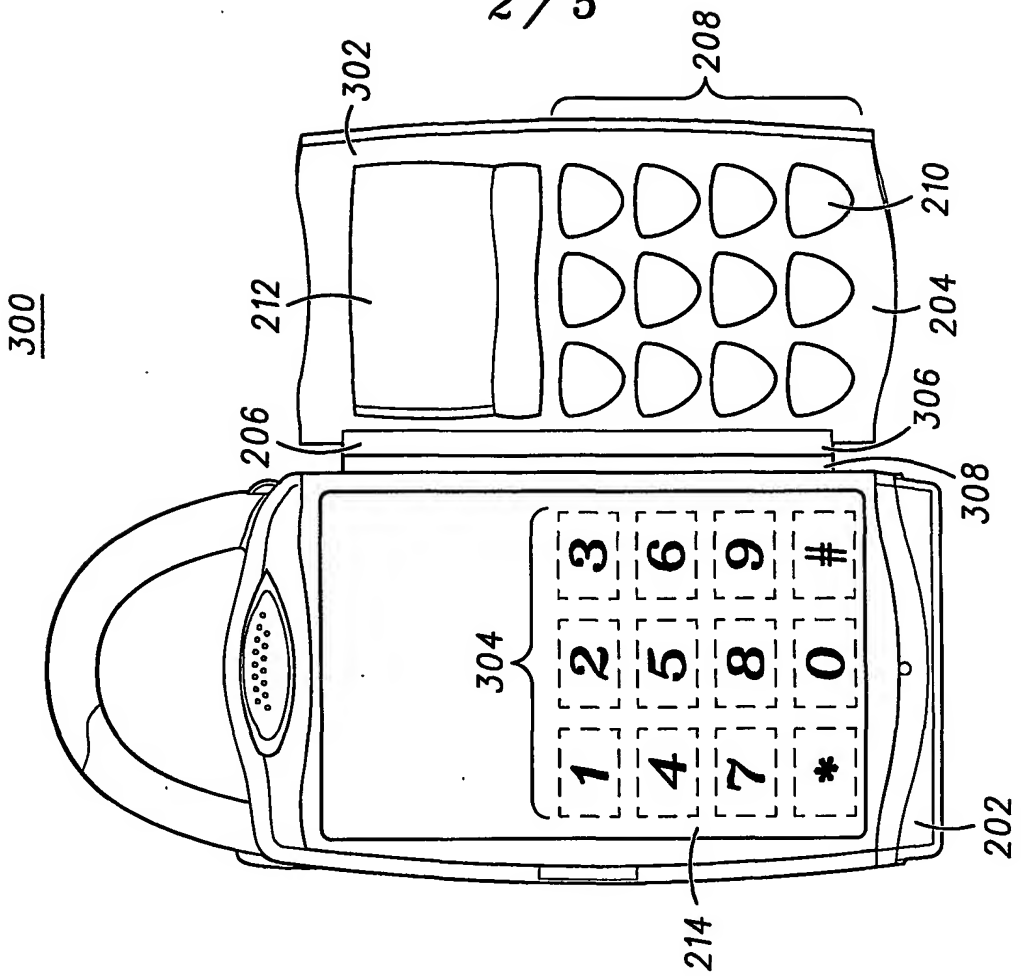

300
302
208
210
212
204
206
306
308
304
1
2
3
4
5
6
7
8
9
*
0
#
214
202

FIG.3

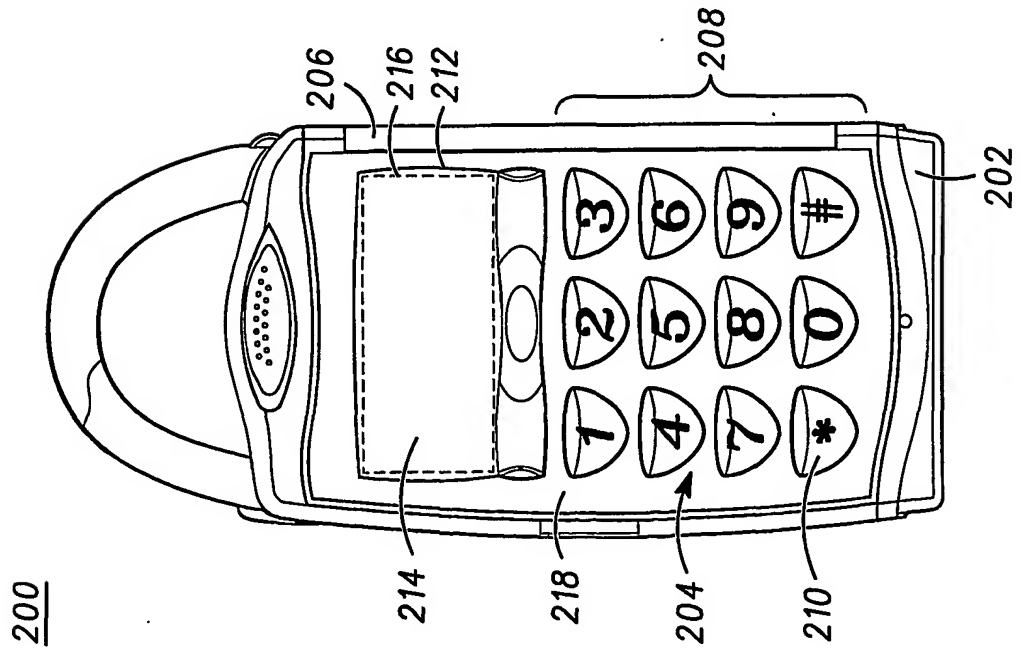

200
206
216
212
208
202
214
218
204
210

FIG.2

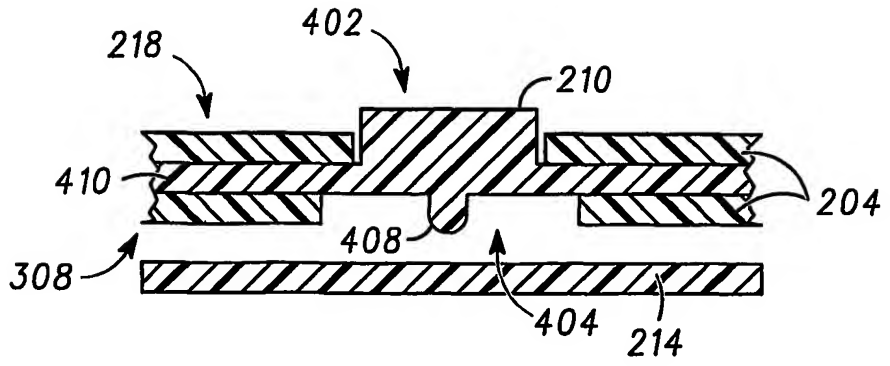

218
402
210
410
204
408
308
404
214

FIG. 4

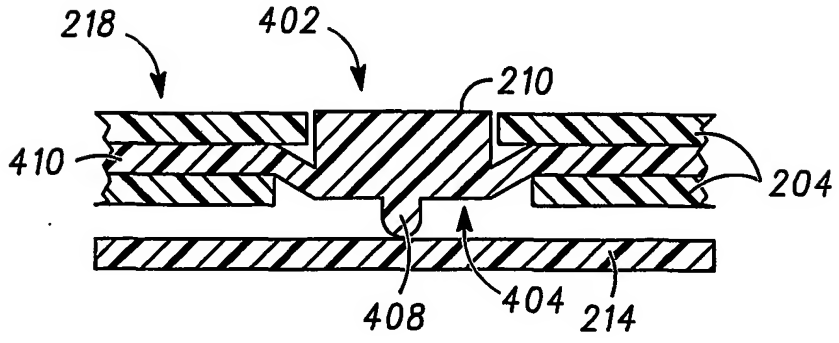
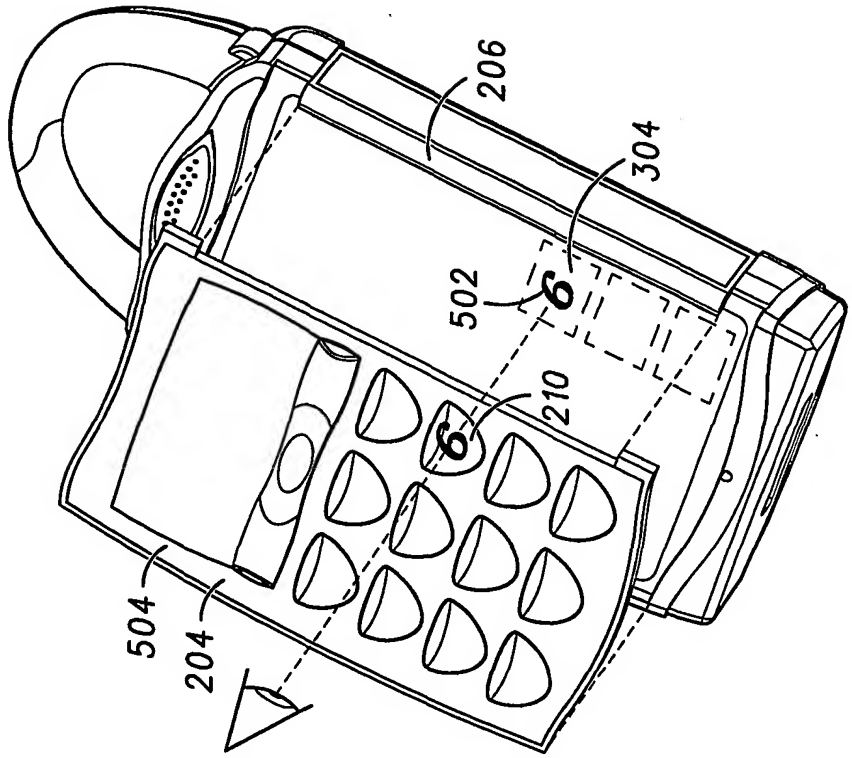

218
402
210
410
204
408
404
214

FIG. 5

FIG.7



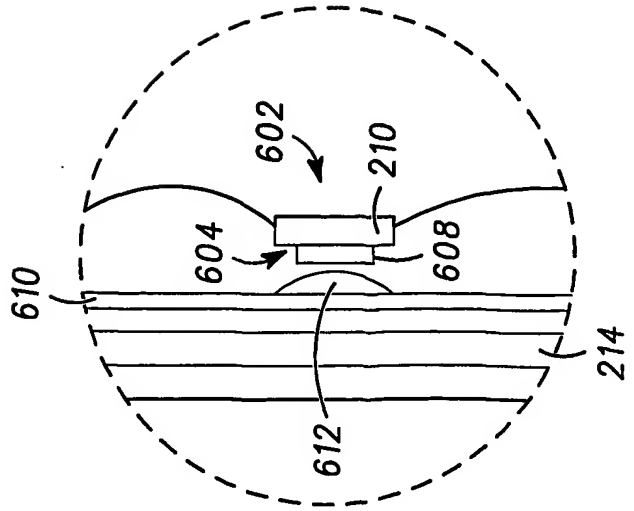


FIG.6

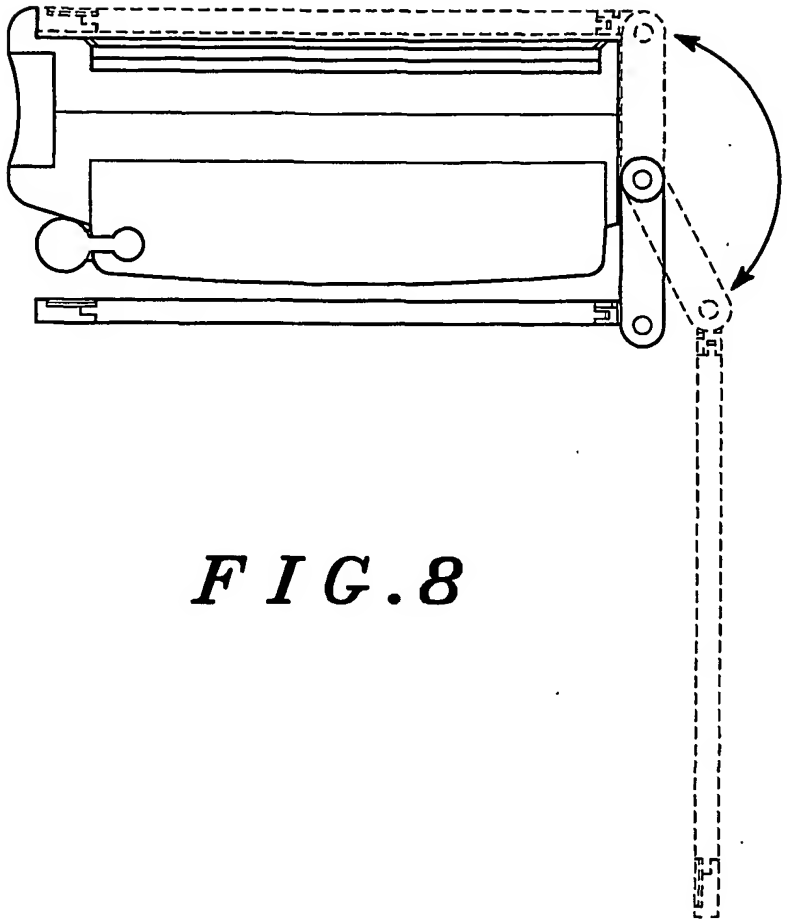


FIG. 8

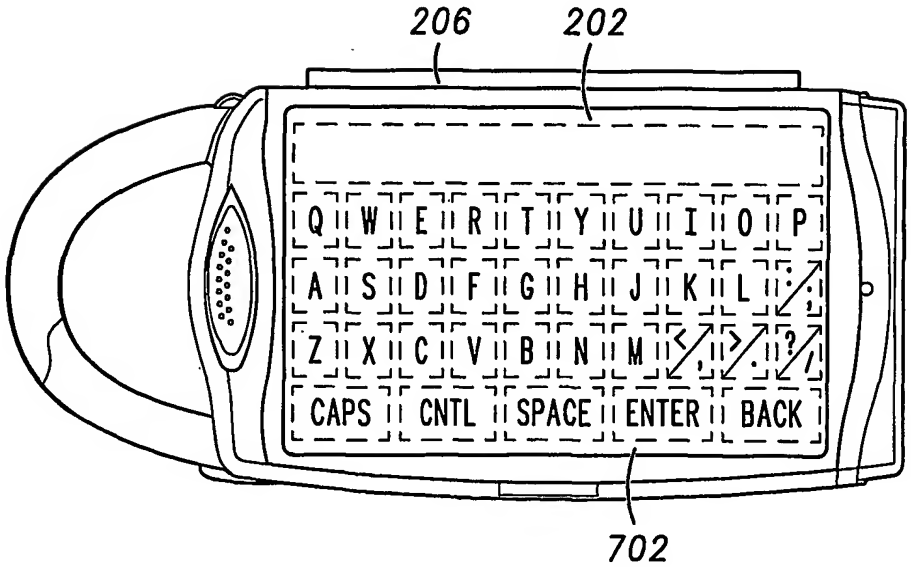

206
202
Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
CAPS CNTL SPACE ENTER BACK
702

FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/31077

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :G09G 5/08

US CL :345/173; 455/90,556,566

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 345/173; 455/90,556,566

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EAST

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,584,054 A (TYNESKY et al) 10 December 1996, col. 1, line 38-col. 2, line 65.	1-20
Y	US 6,130,665 A (ERICSSON) 10 October 2000, col. 4, lines 38-50.	1-20

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 24 JANUARY 2002	Date of mailing of the international search report 13 FEB 2002
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer RICARDO OSORIO for Eugenia Zagan Telephone No. (703) 305-4248

Form PCT/ISA/210 (second sheet) (July 1998)★